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[\[Regeneration and Transplantation\]](#)[◀ Previous Article](#) | [Table of Contents](#) | [Next Article ▶](#)**Viability and survival of hNT neurons determine degree of functional recovery in grafted ischemic rats**Borlongan, Cesario V.<sup>1,2,3</sup>; Saporta, Samuel<sup>1</sup>; Poulos, Stephen G.<sup>1</sup>; Othberg, Agneta<sup>1</sup>; Sanberg, Paul R.<sup>1</sup>**Author Information**<sup>1</sup>Departments of Surgery, Psychiatry, Psychology, and Pharmacology, an University of South Florida College of Medicine, 12901 Bruce B. Downs Blvd, Tampa, FL 33612, USA<sup>2</sup>Present Address: Cellular Neurobiology Branch, Intramural Research Program, National Institute of Health, National Institute on Drug Abuse, 5500 Nathan Shock Drive, Baltimore, MD 21224, USA<sup>3</sup>Corresponding Author: Cesario V. Borlongan

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**Abstract**

We recently reported behavioral improvements following intrastriatal transplantation of cryopreserved cultured human neuroteratocarcinoma-derived cells (hNT neurons) in rats with cerebral ischemia induced by occlusion of the middle cerebral artery. In the present study, the viability and survival of hNT neurons were evaluated immediately prior to the transplantation surgery and at 3 months post-transplantation in ischemic rats. Cryopreserved hNT neurons were routinely thawed, and trypan blue exclusion viability counts revealed 52-95% viable hNT neurons before transplantation. Monthly behavioral tests, starting at 1 month and extending to 3 months post-transplantation, revealed that ischemic animals that were intrastriatally transplanted with hNT neurons (4000) and treated with an immunosuppressive drug displayed normalization of asymmetrical motor behavior compared with ischemic animals that received medium alone. Within subject comparisons of cell viability and subsequent behavioral changes revealed that a high cell viability just prior to transplantation surgery correlated highly with a robust and sustained functional improvement in the transplant recipient. Furthermore, histological analysis of grafted brains revealed a positive correlation between number of surviving hNT neurons and degree of functional recovery. In concert with similar reports on fetal tissue transplantation, we conclude that high cell viability is an important criterion for successful transplantation of cryopreserved neurons derived from cell lines to enhance graft-induced functional effects.

[Back to Top](#)**Introduction**

Neural transplantation has emerged as a potential treatment for neurodegenerative disorders, including Parkinson's disease (PD)<sup>1</sup> and Huntington's disease (HD).<sup>2</sup> Preclinical studies have demonstrated that transplantation of neural cells into the striatum of lesioned animals leads to anatomical integration of the graft with the host tissue as well as to amelioration of behavioral deficits.<sup>3,4</sup>

Recently, neural transplantation experiments have been conducted using cultured human neuroteratocarcinoma cells (hNT neurons) derived from an embryonal carcinoma cell line.<sup>5,6</sup> The hNT neurons differentiate into post-mitotic neuron-like cells following treatment with retinoic acid.<sup>7</sup> These neuron-like cells have been implanted into the brains of normal <sup>6</sup> and ischemic rodents.<sup>8</sup> In this rodent model of stroke, occlusion of the middle cerebral artery (MCA) induces transient, focal cerebral ischemia primarily targeting the striatum,<sup>9-11</sup> and is

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- [Abstract](#)
- [Introduction](#)
- [Materials and Methods](#)
- [Results](#)
- [Discussion](#)
- [Conclusion](#)
- [References](#)
- [IMAGE GALLERY](#)